

**Claims:**

1. A copolymer having  $n$  blocks used as a component of an elastomeric matrix of a sulphur cross-linkable rubber composition with reduced hysteresis, wherein each of said blocks comprises a diene elastomer having a molar content of units originating from conjugated dienes of greater than 15%, and one or each of said blocks which forms the chain end of said copolymer comprises a polyisoprene, wherein  $n = 2$  or 3, wherein:

the number-average molecular weight  $M_{n1}$  of said or each polyisoprene end block is between about 2,500 and 20,000 g/mol;

the number-average molecular weight  $M_{n2}$  of the block of said copolymer which is other than said or each polyisoprene end block is between about 80,000 g/mol and 350,000 g/mol.

2. The block copolymer according to Claim 1, wherein the ratio of said molecular weights  $M_{n1} / M_{n2}$  is between about 5 and 20%.

3. The block copolymer according to Claim 1, wherein  $n=2$ .

4. The block copolymer according to Claim 1, wherein  $n=3$ .

5. The block copolymer according to Claim 1, wherein said block which is other than said or each polyisoprene end block comprises a function capable of interacting with a reinforcing filler.

6. The block copolymer according to Claim 5, wherein said function is capable of interacting with silica.

7. The block copolymer according to Claim 6, wherein said function comprises a silanol group.

8. The block copolymer according to Claim 6, wherein said function comprises a mono-, di- or trialkoxysilane group.

9. The block copolymer according to Claim 5, wherein said function is capable of interacting with carbon black.

10. The block copolymer according to Claim 9, wherein said function comprises a C-Sn bond.

11. The block copolymer according to Claim 10, wherein said function is obtained by reaction with a mono-, di-, tri- or tetrahalotin agent.

12. The block copolymer according to Claim 9, wherein said function comprises an amine group.

13. The block copolymer according to Claim 1, wherein said block which is other than said or each polyisoprene end block is a polybutadiene.

14. The block copolymer according to Claim 1, wherein said block which is other than said or each polyisoprene end block is a copolymer of styrene and butadiene.

15. The block copolymer according to Claim 1, wherein said block which is other than said or each polyisoprene end block is a copolymer of styrene and isoprene.

16. The block copolymer according to Claim 1, wherein said or each polyisoprene end block has a content of 3,4- and 1,2-vinyl linkages which is substantially between about 1 and 20%.

17. The block copolymer according to Claim 13, wherein the polybutadiene block comprises 1,2-linkage content which is between about 10% and 60%.

18. The block copolymer according to Claim 14, wherein the styrene and butadiene copolymer block contents comprises 1,2-linkages and styrene linkages which are between about 10% and 70% and between about 5% and 50%, respectively.

19. A cross-linkable or cross-linked rubber composition comprising an elastomeric matrix, said composition being suitable to exhibit reduced hysteresis in the cross-linked state, wherein said elastomeric matrix comprises a block copolymer according to Claim 1.

20. The rubber composition according to Claim 19, comprising a reinforcing filler, wherein said block which is other than said or each polyisoprene end block is functionalized, coupled or starred for bonding with said reinforcing filler.

21. The rubber composition according to Claim 20, wherein the reinforcing filler comprises a majority proportion of an inorganic reinforcing filler.

22. The rubber composition according to Claim 21, wherein the reinforcing filler is silica.

23. The rubber composition according to Claim 20, wherein the reinforcing filler comprises a majority proportion of carbon black.

24. A tire tread for reducing the rolling resistance of a tire comprising said tire tread, wherein said tire tread comprises a cross-linked rubber composition according to Claim 19.

25. A tire comprising a tread according to claim 24.